DATAMATION 82®

NOVEMBER/4.00 U.S.A.

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SMALL COMPUTERS AT BIG COMPANIES

ALSO:

ANNUAL MINI-MICRO SURVEY

ARE THE TRADE ASSOCIATIONS WORTH THEIR SALT?

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DATAMATION®

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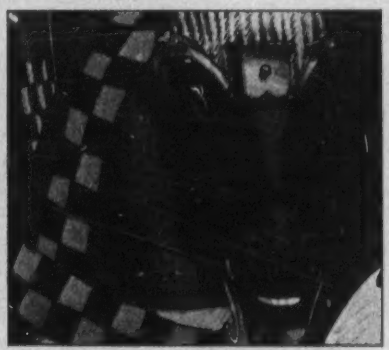

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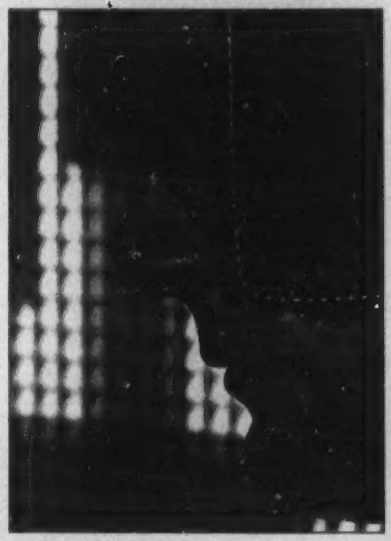

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IN FOCUS

1982 MINI-MICRO SURVEY

Mini sales are slowing as the micro comes on strong; networking is increasing in popularity.

by John W. Verity

Like the rest of the industry, the small computer market looks like it has a tough year ahead of it, according to this year's DATAMATION/Cowen & Co. survey of small computer users. The traditional mini will suffer the most as the personal computer and other micro-based systems steal away new installations and erode existing ones.

This year's survey, taken in July, is based on responses received from 6,743 DATAMATION subscribers throughout the U.S., who said they have more than 44,000 small computers, office systems, and intelligent terminals installed. More than 3,300 of the respondents in the survey said they also had already purchased and installed personal computers, which are the subject of increased analysis this year.

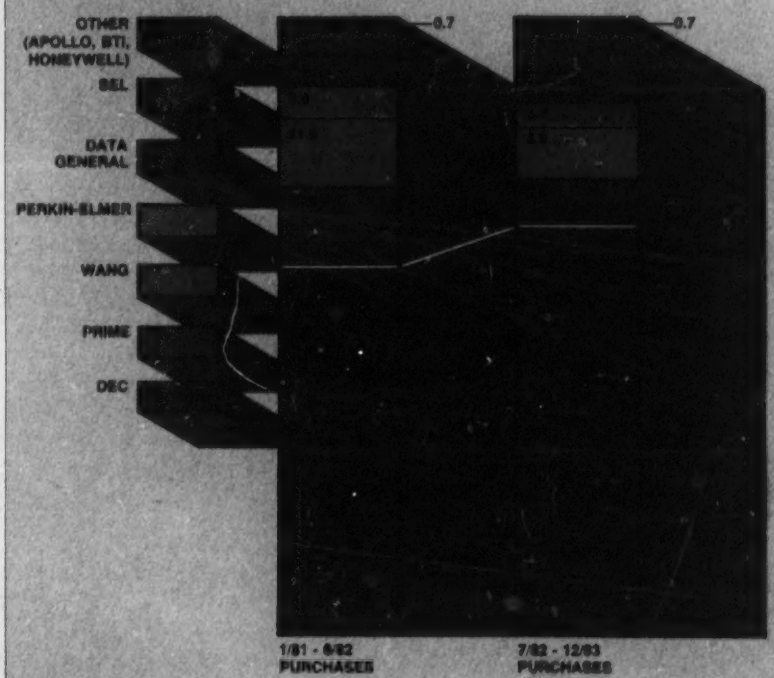
In total, for all applications, 3,278 respondents reported taking delivery of 13,242 minicomputer systems with an estimated purchase value of about $900 million during the 12 months preceding the survey. For the subsequent 12 months, 2,466 users reported plans to purchase 14,542 systems valued at roughly $950 million.

Minicomputer industry shipment growth in the area of 12% to 13% is projected for the year ending June 1983, a figure sharply lower than the more than 23% growth forecast in last year's survey. The figures are adjusted to take estimated new users into account.

Those new users remain a significant source of minicomputer industry growth, but the rate of expansion from them continued to slow, a trend that has been evident for several years. This year's figures showed a 7% growth in new users over 1981, compared to 11% last year over 1980. The overall growth rate for the past eight years is 19%.

Over the past five years, the new user compound growth rate for the overall

FIG. 1
DEC SHARE OF 32-BIT MARKET CONTINUES TO GROW
PERCENT OF RESPONDENT 32-BIT SYSTEMS PURCHASES



* 4.1% from a single site large end user purchase of 100 Prime 250 systems.
• Significant share increase indicated for SEL also.

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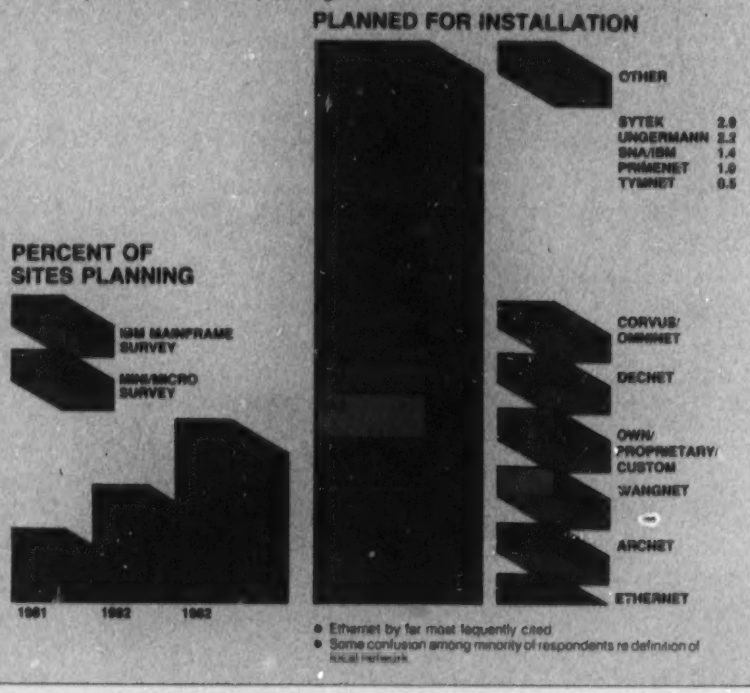
FIG. 2

EIGHT PERCENT OF RESPONDENTS PLAN TO IMPLEMENT LOCAL NETWORKS

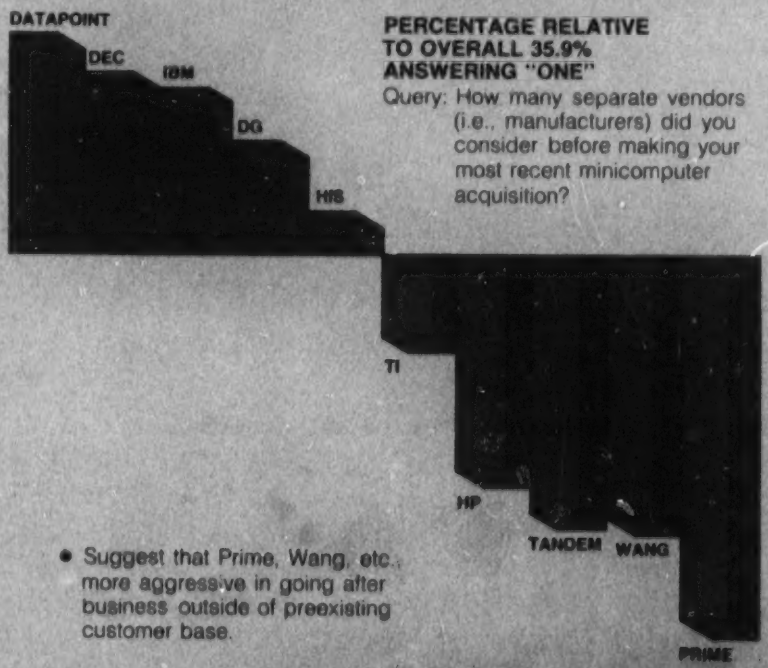
Query: Will your organization install a non-phone line local area network (such as Ethernet) during 1982/83?



- Ethernet by far most fequently cited
- Some confusion among minority of respondents re definition of local network

FIG. 3

DEC AND IBM ENJOY HIGHER THAN AVERAGE INCIDENCE OF SINGLE-SUPPLIER PROCUREMENTS



- Suggest that Prime, Wang, etc., more aggressive in going after business outside of preexisting customer base.

survey base was 16%, but was a more moderate 11% for the oem-only segment of the base. Systems houses showed a 19% growth rate and end users a 16% rate.

The strongest growth in new-to-the-industry minicomputer users was seen in business data processing and office systems applications, which showed growth of 14% and 13% respectively. The lowest such growth was in the education category, where a figure of 7% is thought to reflect inroads being made by the personal computer.

As for applications of minicomputers in general, industrial automation showed a drop as the percentage of the dollar value of shipments compared to the previous year, while medical/biophysical lab, office systems, and business data processing (standalone and distributed) showed gains. Education and training, too, showed a slight drop.

Office systems seems to be an arena Digital Equipment, Prime, and Wang are doing well in; that was the application most often cited for DEC machines planned for installation in 1982 and 1983.

Software and support continue to increase as a percentage of the spending planned by minicomputer users. Previous to last July, respondents said, they spent 18.6% on support while in the following 12 months they will spend 19.5%.

Database management system (DBMS) usage among minicomputer respondents is heaviest in shops where Hewlett-Packard, Microdata, and Tandem are the principal mini suppliers. In the network software category, Tandem is far and away the leader, with 60% of its sites involved. It is followed by ModComp (which sells primarily into the industrial automation market), Burroughs, Datapoint, and Four-Phase.

Industry growth of 12% to 13% is projected for the year ending June 1983, a figure sharply lower than the 23% forecast in last year's survey.

DBMS usage is expected to grow 17% compounded over the next two years, while network software is pegged at 35% for the same period. Some 28.3% of the respondents said they were using mini DBMS software and another 10% said they will install it for the first time in the coming year. As for network software, 9.2% of all respondents are using it, with another 7% planning to add it during this year and next.

Some interesting data concerning the field of local networking were revealed by this year's survey. Asked what the primary mode of minicomputer use was, respondents showed a discernible increase in peer networks, or connecting minis to each other without an intervening host. This year's figure of 5.7% of sites using peer

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networking is up from last year's 4.0% and is thought to signify the increasing use of local networking.

Host networking accounted for 12.2% of the sites responding while 65.9% said they ran standalone minis interactively; the remaining sites ran standalone batch systems.

In response to a question of whether they intended to install non-phone line local networks, 8% of the respondents said they would during 1982-83. Of those, 20.9% said they would use the Ethernet scheme promoted by Xerox, Intel, Digital Equipment, and a host of other firms. After that came 8.7% for Datapoint's Arcnet, 8.3% for Wangnet, 5.8% for DECnet, and 5.1% for the Corvus/Omninet designed for Apple computers. Some confusion was seen in the respondents' understanding of the definition of a local network, perhaps because the concept is a relatively new one.

Interestingly, local networking seems to have gained more interest among the mini users in this survey population than

Users continue to be loyal to their mini suppliers; 82.6% said they had no plans to switch.

was seen in a sample of IBM mainframe users surveyed by DATAMATION/Cowen earlier this year (May, p. 34).

Each year the mini-micro survey investigates what factors are important to users in selecting their machines. As has been the case in the last two years, hardware reliability is the main factor, followed by vendor reputation.

Asked if they expected to change principal mini suppliers over the next 12 months, 10.7% of the responding sites said they were seriously considering it, 6.7% said would make a switch, and 82.6% said they had no such plans. The comparable figures from last year's survey were 11.3% considering, 7.2% yes, and 81.5% no.

In terms of the vendors as principal suppliers, Tandem continued to show the highest loyalty among customers, with only 7.5% of its sites saying they were planning or considering a switch. Last year the firm showed a figure of 0.0%. DEC and IBM also fared well at 11% each. The highest risk of defections was seen in figures for Northern Telecom, with its aging base of Data 100 and Sycor equipment; ModComp; Computer Automation; and Univac, which a few years ago took over the Varian Data customer base.

Software support was the most cited reason for considering a switch of vendors, particularly among end users. Oem/systems house respondents cited price and software support as the main factors in considering a change.

Until the end of 1981, customers of DEC had stated to previous surveys that they

FIG. 4

APPLICATIONS SOFTWARE DEVELOPMENT FOR PERSONAL COMPUTERS VS. MINICOMPUTERS

Query: Who primarily develops the applications software for your organizations?

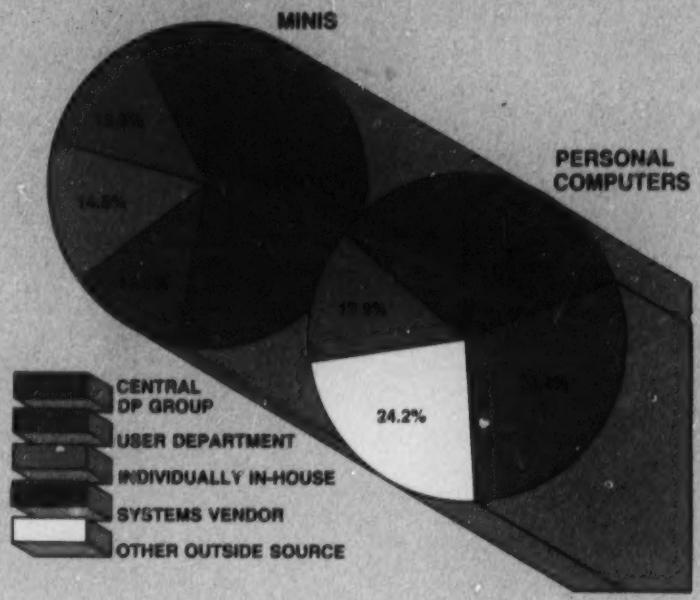
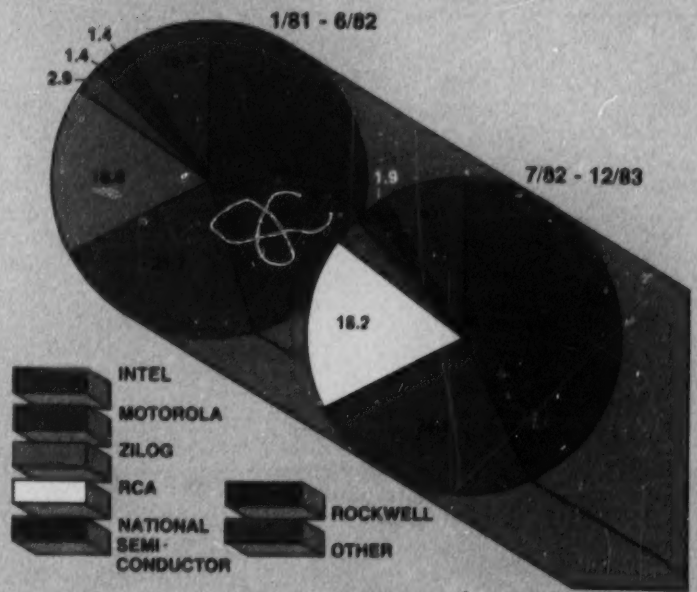


FIG. 5

INTEL STILL THE MOST FREQUENTLY CITED MICROPROCESSOR CHIP SUPPLIER

PERCENT OF SITE MENTIONS



- Lineup among top three unchanged during past five surveys.
- 25% of these sites planning 16-bit microprocessor purchase during 7/82-12/83, up from 13% in 1/81-6/82.

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were upset with the company's inability to deliver equipment fast enough, but that log-jam has since been cleared up. Among those sites considering a switch of main vendors, only 5.8% of those with DEC as that vendor were considering a switch because of delivery schedules. Last year the figure was 19.3% and the year before,

The trend toward single-supplier procurements of all types of mini-based systems—small business machines, traditional minis, intelligent terminals, and office systems—continues. In those categories 32%, 37%, 31%, and 28% of all sites, respectively, said they were considering a single source. In general, the data suggest a continuing process of consolidation favoring already established suppliers.

DEC and IBM, according to the survey, enjoy a higher-than-average incidence of single-supplier procurements. In contrast, it appears that Wang and Prime are more aggressive in going after business outside their existing customer bases. Also, the data show that Hewlett-Packard is the most frequent competitor of DEC while IBM is the most frequent competitor at HP sites.

The strongest peripherals shipment growth this year will be in small hard-disk drives and graphics terminals.

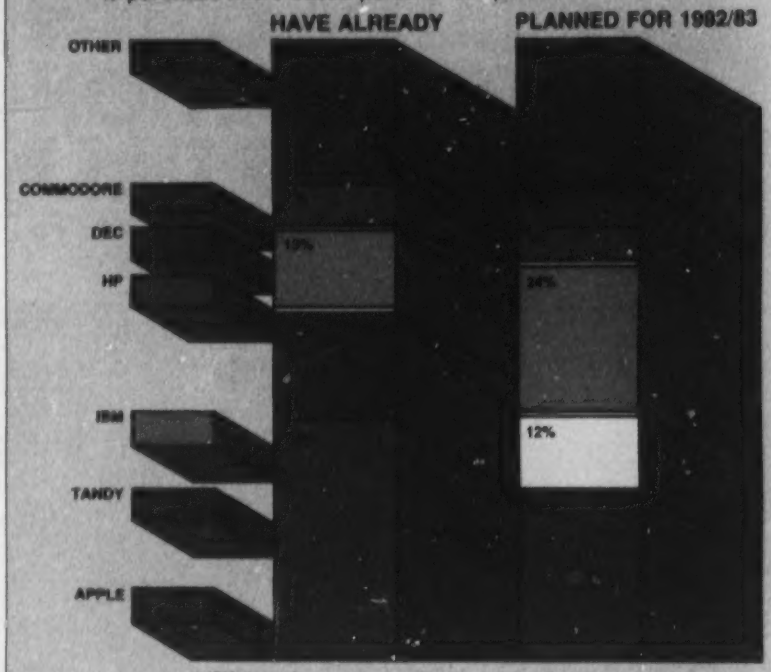
In addition to investigating central processors, the survey questioned users about their buying plans for peripherals to attach to those systems. On average, 63% of the responding sites said they specify the cpu supplier for peripherals as well. The vendor that gains the most peripherals sales from its processor users is HP, with an 81% share. It is followed by Wang, IBM, Datapoint, Tandem, and Honeywell, which are all above average. Below average, in order, come DEC, Data General, Perkin-Elmer, and Prime.

The strongest peripherals shipment growth this year will be in small hard-disk drives and graphics terminals. Disks under 50 megabytes are enjoying a shipment growth rate of about 103% compared to last year, while the terminals show a rate of 76.7%. The leading disk suppliers are International Memories Inc., Seagate Technology, and IBM, while the terminals suppliers named most by respondents were DEC, HP, and Data General.

DEC is the leading peripherals supplier to the survey's population, selling the largest share of hard disks over 50 megabytes, graphics crts, and add-on memories. Shugart gained the top slot in supplying floppy disk drives over Micropolis, according to survey data.

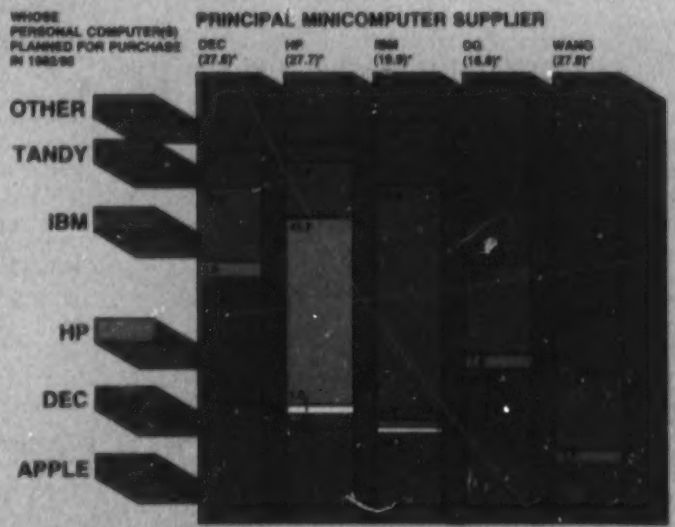
The amount of disk storage being attached to minicomputers is on the rise again after the plateau seen in last year's survey. The average amount of disk storage on systems this year was 262 megabytes,

FIG. 6
PERSONAL COMPUTER PURCHASES
Query: Have you or your organization purchased or are you planning to purchase micro-based personal computers?



- IBM share of prospective installations twice that of previous installations
- Three times for DEC off much smaller base.
- HP percentage relatively steady

FIG. 7
EFFECT OF MINICOMPUTER SUPPLIER ON PERSONAL COMPUTER CHOICE



* Figures in parentheses represent percent of sites planning personal computer purchase during 1982/83. ** 38.9% Wang.

- Still-broad penetration of DEC minicomputer user base and of IBM base by Apple, notwithstanding subsequent PC introductions by these mini systems suppliers themselves.

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compared to last year's figure of 143 megs and the year before's figure of 149 megs. (The numbers relate to disks attached to the last system purchased.) It is thought that the data reflect a greater strength in high-end systems such as DEC's VAX. Tandem led the pack in average disk size, with 502 megabytes attached to its average system. At the other end of the scale was Datapoint with 64 megabytes and Northern Telecom with 28 megs.

Average main memory size of minicomputers also continued to rise, this year reaching 551,000 bytes. Last year's comparable figure was 383,000 bytes. The increase was seen in equipment from almost every vendor. A more dramatic growth in main memory was seen in microcomputers, where the average size this year was 95,000 bytes compared to 55,000 bytes last year. This clearly bodes favorably for memory chip suppliers, who can expect to sell very large unit volumes.

In terms of peripherals purchases for personal computers, 79% of users running such machines said they bought printers, 74% bought monitors, 79% bought floppy disks, and 31% bought rigid disks.

The survey this year revealed a shifting pattern of distribution in the minicomputer system market. The oem/systems house and dealer/distributor categories each showed a slight increase as the channel by which respondents received their machines. Shipments directly from manufacturers fell slightly from last year's survey, while retail stores did not change at all. A small increase in sales through used equipment dealers was seen, possibly indicating an increasing maturation of the traditional mini market.

Pricing and discounts as competitive tools were seen as particularly important to Prime, Perkin-Elmer, and Texas Instruments. As expected, IBM was at the low end of the list of discounters.

Average main memory size of minis has continued to rise, this this year reaching 551,000 bytes.

Outright purchase remains the predominant mode of acquiring minicomputer equipment. In terms of dollar value, Data General, DEC, and TI machines were leased (largely via third parties) least often, Datapoint and IBM most frequently.

The survey data show DEC increasing its total market share, largely as a result of projected VAX and PDP-11/23 shipments. In the past 18 months, DEC held a 34.5% share of the dollar value of minicomputer shipments, but in the coming 18 months respondents indicated they would spend 39.5% of their minicomputer money with DEC. Close behind was IBM, which had comparable figures of 14.2% for the past 18 months and 13.7% for future spending. Next was HP with 9.8% past and 9.0% future spending.

In the small business sytems submarket, IBM led with a 30.0% share of past 18 months' purchase value and a projected 24.2% for future spending. DEC followed with 14.7% past and 14.9% future. It was shown that HP, Tandem, and Wang are picking up share in the small business systems segment, as is newcomer Convergent Technologies. The drop in projected IBM shipment values was attributed to the aging System/34 product cycle. Sizable declines were also seen for Data General (dropping to 6.3% from 4.8%), Honeywell, and Burroughs.

In the traditional minicomputer market, DEC was far ahead of the pack in terms of percentage of 18-month-past and future purchase values. The firm showed a 44.1% rating for the past 18 months and a 47.1% share for future purchases. Next was IBM, with 9.4% past and 11.0% future, indicating perhaps that its Series/1 product is still gaining in this market. IBM has garnered a strong second place in the minicomputer market a mere six years after entering it with the Series/1.

Prospective shipment trends look weakest in the traditional minicomputer segment of the market, according to the survey data. But in sharp contrast, the personal computer segment is expected to experience a 99% increase in unit volume and a 114% increase in dollar volume with about half of the growth projected to come from new users. Roughly 60% of previous users are planning to purchase personal machines in the current year as well. The average number of units will be six or seven and the average price per unit will be $4,600, according to the survey.

Thus it appears that the personal computer market will be a significant source of incremental growth for those minicomputer manufacturers who can effectively participate in it.

Growth in the traditional mini market is coming more and more from the 32-bit arena, where unit and dollar volumes are ahead of the overall market's growth. In terms of units, planned purchases of 32-bit machines for the year ending June 1983 will make up 11.8% of overall minicomputer unit shipments. In terms of dollars, however, those machines will make up 36% of

TABLE I

TOP 10 MINICOMPUTER SYSTEMS 1982/83

A. Based on number of respondents acquiring systems (7/82-12/83)

MANUFACTURER	SYSTEM	HOW MANY SITES ACQUIRING	AVG. UNITS/ SITE
DEC	VAX-11/780	147	2.1
DEC	VAX-11/750	102	1.4
IBM	System/38	92	1.1
HP	3000 Unspec.	92	2.2
IBM	System/34	82	1.4
DEC	PDP-11/44	81	1.5
IBM	Series/1	75	7.1
DEC	VAX Unspec.	78	1.5
DEC	PDP-11/23	69	12.4
DEC	VAX-11/730	61	1.6

B. Based on number of units being acquired (7/82-12/83)

MANUFACTURER	SYSTEM	HOW MANY UNITS BEING ACQUIRED	EST. VALUE ($ MILLIONS)
DEC	PDP-11/23	857	$23.0
IBM	Series/1	533	21.4
DG	Nova Unspec.	341	4.5
DEC	VAX-11/780	311	103.7
DG	Nova 4	287	3.2
TI	990 Unspec.	274	12.9
IBM	8100	208	20.6
HP	3000 Unspec.	200	36.1
DEC	VAX-11/750	144	25.5
Datapoint	8600	132	2.4

• In total, 2,466 respondents (37%) reported plans to purchase 14,542 systems valued at roughly $950 million betwen 7/82 and 7/83.

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TABLE II

PERCENT OF SITES PLANNING/CONSIDERING VENDOR SWITCH

MANUFACTURER	1980 SURVEY	1981 SURVEY	1982 SURVEY
Basic Four	16.9	32.7	26.5
Burroughs	29.6	27.0	29.5
Computer Automation	23.1	31.8	46.2
Data General	18.2	22.0	25.0
Datapoint	9.4	15.2	22.4
DEC	12.8	13.2	11.0
Four Phase	20.0	19.6	29.2
General Automation	53.8	60.0	25.0
Harris	24.6	30.0	25.0
Hewlett-Packard	10.6	10.7	14.3
Honeywell	17.9	21.4	15.7
IBM	11.9	12.8	11.1
Microdata	20.3	16.2	25.0
Modcomp	17.9	23.3	36.4
NCR	19.8	15.5	22.4
Northern Telecom (Sycor)	41.7	30.0	52.6
Perkin-Elmer	19.8	26.2	18.0
Prime	8.3	8.2	14.1
SEL	11.1	16.7	13.6
Tandem	6.9	0.0	7.5
Texas Instruments	14.5	18.3	16.8
Univac/Varian	22.6/23.3	26.7/38.5	32.6
Wang	15.6	19.3	16.1
Total Sites	17.2	18.6	17.4

- Tandem continues to enjoy highest degree of customer loyalty.
- Consistently high also for IBM and DEC.
- But some deterioration in this year's data for HP and Prime, albeit to still better than aggregate percentages.
- Negative trend of past two years for Datapoint and Data General persisted in 1982 survey.

purchase value during the same period. This is occurring despite a modest drop in the 32-bit system unit price, generally attributed to a changing mix of systems at DEC, the 32-bit leader, to newer, smaller VAX systems.

In fact, DEC's share of the 32-bit market is even greater than its share of the total market and it is growing. Survey respondents indicated that 66.4% of their 32-bit system purchases will be from DEC during the 18-month period ending in December 1983. Following DEC are Wang, with an 8.9% share; Prime at 7.6%; SEL at 7.5%; and Data General at 5.0%. Perkin-Elmer's share will drop from 5.0% of purchases made in the previous 18 months to 3.9% in the next 18-month period.

Interest in personal computers was found to be proportional to the organization's size. For companies under $50 million in annual revenues, only 21.5% said they would emphasize personal computers for future small system applications while in the over-$500 million category, 30.4% of respondents said they would do so.

Potential incursion of the personal computer into minicomputer markets seems strongest in the office systems segment. The machines will be used most, the survey indicates, by organizations involved in education, insurance, and business services and least by communications suppliers, utilities, and wholesale/retail operators.

Fueled by IBM's entry into the personal computer market, the year-to-year expansion of personal/desktop computers was even more rapid in 1982 than a year ago. The latest three-year compound growth rate for such machines was 109% for all sites, 87% for personal use, and 113% for organizational use. The figures from last year's survey are 106%, 94%, and 107%, showing that organizational use of the machines is growing faster than personal use. Indeed, 86.7% of the machines purchased by respondents will be for organizational use.

IBM's entry into the market has

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TABLE III

REASONS FOR PLANNING/CONSIDERING VENDOR SWITCH

CURRENT PRINCIPAL VENDOR	PERCENT OF "SWITCHING SITES" DISSATISFIED WITH: DELIVERY SCHEDULES	PRICE	HARDWARE RELIABILITY	SOFTWARE SUPPORT	SALES/SERV ORG.	OTHER
Basic Four	11.1	22.2	11.1	50.0	27.8	22.2
Burroughs	3.0	15.2	33.3	57.6	21.2	21.2
Computer Automation*	16.7	16.7	—	66.7	50.0	33.3
Data General	4.9	20.7	30.5	35.4	28.0	23.2
Datapoint	21.1	18.4	13.2	26.3	26.3	31.6
DEC	5.8	23.1	22.4	34.0	24.4	25.6
Four Phase	7.1	3.6	21.4	50.0	17.9	21.4
General Automation*	—	25.0	25.0	75.0	—	50.0
Harris	—	9.1	27.3	72.7	9.1	9.1
Hewlett-Packard	2.5	22.8	16.5	30.4	24.1	36.7
Honeywell	—	4.8	33.3	66.7	9.5	19.0
IBM	6.8	31.5	15.1	38.4	21.9	24.7
Microdata	—	—	23.5	41.2	35.3	35.3
ModComp	—	16.7	25.0	41.7	8.3	25.0
NCR	—	20.0	20.0	40.0	33.3	20.0
Northern Telecom (Sycor)	—	20.0	60.0	20.0	20.0	30.0
Perkin-Elmer*	—	—	22.2	66.7	33.3	11.1
Prime	3.4	31.0	31.0	37.9	17.2	27.6
SEL*	—	—	—	100.0	—	66.7
Tandem*	—	—	33.3	33.3	—	33.3
Texas Instruments	5.6	38.9	11.1	11.1	44.4	22.2
Univac	—	7.1	50.0	71.4	14.3	21.4
Wang	6.5	16.1	19.4	22.6	38.7	29.0
Total Sites	5.0	20.5	22.6	39.5	22.2	27.8

* Less than 10 sites

helped accelerate this trend. Also, IBM personal computers appear to be purchased more centrally than other brands.

The most important selection criterion for PCs is software, followed by price, product reputation, and compatibility with installed machines. Compatibility seems to be especially important to those buying DEC, Wang, and Zenith PCs.

It looks as if packaged software for personal computers will sell slightly better, in terms of future growth, than hardware. For the 12 months following the survey date, respondents said they would spend 87.7% of their personal computing budget on hardware and 12.3% on software. VisiCalc, and its look-alikes, is by far the most used software package, representing about 56% of all packaged software mentions by respondents. Word processing was the next most popular software purchase with about 25% of the mentions.

As for distribution of personal machines, the independent store was the most frequently cited channel. For IBM, only 7% of its personal computers were being bought through IBM-owned stores.

Unlike the IBM personal computer, DEC's and HP's small machines have apparently made little impact outside their base of minicomputer users. However, Apple has maintained a strong penetration into IBM and DEC minicomputer user sites.

In terms of future shipments, 2,359 responding sites said they would purchase 35,667 personal machines during the 18-month period ending in December 1983. During the previous 18 months, 3,360 respondents purchased 22,410 units. Of the planned purchases, 31.3% will be Apples, 18% IBM, 10% Tandy, and 7.3% DEC (vs. 40.7%, 15.1%, 9.6%, and 1.4%, respectively, of machines installed during the previous 18 months).

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architectures entail many processors working together to solve a problem as opposed to the single-processor, or von Neumann, design used in traditional machines. It is generally thought that parallel machines will provide far greater future improvements in computer performance than can be gained from improved semiconductor technology.

Parallel systems are expected to be necessary to handle the so-called artificial intelligence functions that it is hoped future machines will perform. Japan's proposed fifth generation machine, in fact, is to include such subsystems as a "knowledge base management system," "inference engine," and "inferotemporal cortex machine," according to literature presented at the Tokyo conference last year. Theoretically, at least, the fifth generation machine and others of its ilk would process knowledge, not just numerical data.

"We've never had a big enough program to do crash projects. We've only been able to scratch the surface."

One of the parallel systems already being funded by ARPA is the Non-Von (for non-von Neumann), whose principal designer is Dr. David Elliot Shaw, a professor at Columbia University in New York. Construction of a Non-Von prototype will be helped by a two-year, $2.5 million ARPA contract. Although its development is in the early stages, the Non-Von project provides a good picture of the kind of cooperative resources ARPA could bring into play should a national computer research effort get under way.

Non-Von is to be composed of as many as a million microprocessors arranged in a binary tree (each element in the tree is connected to two elements below it) and will handle traditional commercial data processing tasks as well as the numerical processing usually reserved for supercomputers, according to Shaw.

"We're using tiny microprocessors which are actually quite slow individually," the professor explained. "Each one is much smaller than an [Intel] 8080. I'd say that one instruction on a conventional 16-bit microprocessor would be the equivalent of four or five instructions on the micros we're going to use."

The micros Shaw plans to use are being custom designed at Columbia and will most likely be manufactured by a West Coast semiconductor maker, he said. Their packaging will be different from most microprocessors in that several (perhaps a few dozen) micros will be packaged with accompanying RAM memory on a single silicon substrate.

This method reduces manufacturing costs, increases performance, and helps keep down maintenance efforts on the finished machine.

The custom chips are being logically defined on a color CAD/CAM system, said Shaw, noting that once the definitions are finished they will be sent electronically to the West Coast for fabrication. The means of transport, of course, is the ARPANET, which connects many advanced computing research labs in the country. In Marina Del Rey, Calif., the Information Sciences Institute will process Columbia's definitions and produce standard mask tapes with which a semiconductor maker can finally produce the chips, which will be sent to Shaw's group on Manhattan's Upper West Side.

In addition to helping buy chips, the ARPA grant will aid Shaw in recruiting a small team of "extraordinarily gifted engineers and computer scientists," who will join the two dozen or so workers already involved. Although "only a handful" of such individuals exist, Dr. Shaw said he believes that "the kind of superstar we're looking for will be unable to resist the temptation to help build the world's most powerful computer."

Two corporations, IBM and Digital Equipment, are also aiding, and presumably keeping an eye on, the Non-Von project. IBM's "very generous" $600,000 funding came with an open invitation to "talk shop" at the firm's Yorktown Heights, N.Y., research facility. DEC has been kind enough to discount some VAX gear quite heavily and is also developing a working relationship with the Columbia researchers, according to Shaw. "We're very interested in contact with manufacturers," he said. "What we're doing now is in the public domain. We're pushing the frontiers of science."

A parallel computer architecture is being worked on by a dozen or so ARPA-backed researchers at Columbia University.

Non-Von and other microprocessor-intensive systems are just the type of machines ARPA would like to investigate, according to Robert Kahn. "Non-Von and New York University's Ultra machine are examples of the kind of projects that could be accelerated," he commented. "We had once funded the dataflow machine at MIT, but then the Energy Department took over."

The next job for Kahn and his boss Cooper, it would seem, is to sell their idea to budget writers at the Department of Defense and then to Congress itself. With the Japanese industrial specter looming as large as it does in the general press, in Detroit unemployment lines, and in Silicon Valley, ARPA's idea may be one whose time has come.

—John W. Verity

FAULT TOLERANCE

FAIL-SAFE VENDORS EMERGE

About a dozen makers of fault-tolerant computers can be identified in a market that Tandem for eight years called its own.

As if by prearranged signal, it suddenly has become evident that a flotilla of fault-tolerant computer makers has emerged, mucking up waters that had previously been the exclusive province of Tandem Computers. Tandem, founded in 1974 and shipping hardware since May 1976, has prospered in its own little pond, closing its latest fiscal year in September with revenues of more than $300 million. But by one estimate, there are a dozen or so companies already in or preparing to enter the fray.

Not to worry, says consultant David Gold of San Jose, Calif. "I think there's a big enough market out there for them and Tandem and probably lots of others without any of them feeling the pain from competitors."

By one count, fault-tolerant computers have applications in process control and industrial automation in general, in certain shared-logic word processing systems, in microcomputer networks that allow for the sharing of resources, and in on-line transaction processing. When all those applications are included, the market in 1986 will come to almost $22 billion, says Omri Serlin of Los Altos, Calif. The consultant, who just completed a study of this market and its participants, says the current vendors and those planning first product introductions by the end of '83 will be able to realize only some 15% of that demand. That leaves the rest of the market to be satisfied by conventional minicomputer and mainframe approaches.

Into this market has come a ton of companies with systems built around the ubiquitous microprocessor chip. The vast majority of them are going after the on-line transaction processing market, which Tandem also serves. Serlin estimates that these startup companies have been funded by venture capitalists to the tune of more than $50 million, and the transaction processing market they are entering has a potential of almost $17 billion by '86. He sees Tandem taking $2.5 billion of that total, the upstarts being able to grab much less, and the majority of it not realized by the current crop of systems makers.

The transaction processing market can trace its genesis back to the 1960s,

TABLE I

FAULT-TOLERANT SYSTEMS MARKETS IN 1986
(BILLIONS OF 1981 DOLLARS)

SEGMENT	POTENTIAL	REALIZABLE	% PENETRATION
On-line transaction processing	$17.0	$3.3	19
Data acquisition, process control	3.6	0.24	7
Microcomputer networks	0.6	0.02	3
Word processing	0.9	0.05	5

Source: ITOM International Co.

Present and future vendors of fault-tolerant systems are expected to capture only a fraction of the enormous markets that will potentially exist in 1986. By '86 Tandem is expected to be a $2.5 billion company.

when business transactions were initially recorded with paper and pencil, the data then being keypunched at night and run against files stored in the computer. In the 1970s, with the development of database management systems, on-line inquiries to a database became economically feasible, but updates were generally made at night in the batch mode. It is thought that in the '80s the new vendors will make it possible for transactions in real-time to occur against a database, much like the airline reservations systems and automatic bank teller machine transactions.

"Microprocessors are giving these newcomers new technological ways to approach the fault-tolerant operation," Serlin says, and those design approaches are significantly different from Tandem's. The environment today, he adds, is similar to what existed when Tandem started in '74. At that time, Tandem was able to take advantage of a mature minicomputer technology, harnessing the small processors to offer attractive price-performance levels in competition with mainframers like IBM and Univac.

"You have the same situation now," he explains, "except now it's working against Tandem." Today people are able to harness the power of very powerful 16-bit microprocessors that cost a mere $40 or $50 each, showing how such processing power can be plugged in to satisfy redundancy requirements and to provide ever more processing power upgrades.

Indeed it is not certain that Tandem's NonStop systems sell so well because of their fault-tolerant features. "The fault-tolerant capability is the sizzle," says Dave Gold, "but I think in fact a lot of people buy Tandem because it's incrementally upgradable, and they have a nice database system and networking and so on."

Similar sentiments are expressed by the head of a software company that has developed an integrated, interactive, manufacturing software system that runs on the Tandem system. The fault-tolerant feature, says Redwood Software president C. Stephen Johnson, "wasn't the first thing that attracted us to do something on a Tandem." Rather, he says, it was the graceful growth capability and the networking facilities.

With this networking capability and the ability to plug in more processors as they're needed, Tandem's users can grow their system as their needs grow, and without rewriting their applications programs—which are completely insulated from the configuration details. The user need not know how many processors there are or what particular peripherals are connected to what specific processor.

(Up to 16 processors will fit into a Tandem cabinet, but more can go into an adjoining box. The company's networking software allows up to 255 of them to work together. The largest user is Tandem itself, with more than 140 systems, something like 400 processors worldwide. And there are paying customers who have hundreds. To date, the company has shipped more than 4,000 processors.)

"There's a big enough market out there for Tandem and lots of others without any of them feeling the pain from competitors."

The idea of merely adding another processor whenever the workload demands it is very appealing to the user. It is perhaps in recognition of this appeal that a number of startups have entered this business. Serlin names a dozen in the U.S. and the U.K.

One such company is Synapse Computer Corp., Milpitas, Calif., which was founded in August 1980 and is already funded to the tune of almost $14 million by a number of investors. The firm uses Motorola 68000 microprocessors both as dedicated processors to run applications programs and as dedicated I/O processors. The distinguishing feature of Synapse's product is the absence of local memory at the processors that execute user programs, which instead share a central memory in a tightly coupled fashion. In a design called N + 1, it provides as many applications processors as are required by the workload, plus one more for redundancy. The performance range is said to be from the equivalent of a VAX 780-class machine, or an IBM 4341, up to an IBM 3081.

"Computers are becoming a part of everyday life," explains Synapse president Mark Leslie. "People are getting used to seeing terminals, dealing with automatic teller machines." With the cost of disk storage declining twice as rapidly as the cost of silicon, he says, "people are putting more and more [data] on-line and want more users to have access to it."

That is an observation made also by consultant Serlin. He notes that Tandem has been in the on-line environment, where users simultaneously are making inquiries to a database. This means the system experiences very short bursts of activities—and you don't need a very powerful cpu for that. You need instead very powerful access to peripherals, disks in particular.

"The cpu requirements are not very high," he says. "That was one of the major reasons Tandem succeeded—recognizing that characteristic." The founders saw that they could attack this market more effectively with multiple minicomputers, whereas people at that time were applying large mainframes to such systems tasks.

In some applications, of course, a small processor will run out of steam, and the Tandem processors are no exception. Redwood Software's Johnson says he sometimes wishes he had the use of a bigger computer than Tandem's mini, which runs out of horsepower on jobs that run in the batch mode, such as modeling.

Is he happy with Tandem's 16-bit architecture? "Well, I would like them to go to a 32- or a 64-bit design," Johnson says, "and they probably will some day. But [the 16-bit architecture] is not a tremendous limitation right now." The original NonStop is, of course, limited to the direct addressing of 128K bytes, which prompted the development of the NonStop II and its 32-bit addressing scheme and the use of an address translation box. Now, when Johnson's software is made to run on the NonStop II, it would be possible for programs to build larger date arrays. And the programs wouldn't have to go out to disk as often.

"I think some of the new architectures that are coming out have a lot of advantages over Tandem," Johnson adds, advantages that stem from the use of more recent technology. But he cites Tandem's networking capabilities, its database system, and various software tools and says, "Tandem has a lot of advantages over most of the newer computers coming out."

The technology issue has to do with more than the addressing space, even though the Motorola 68000 processor can

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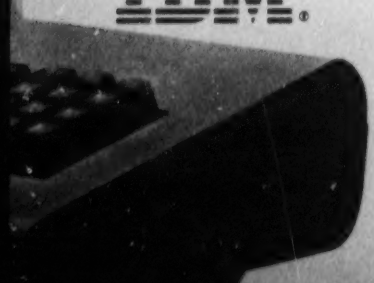


NEWS IN PERSPECTIVE

FAULT TOLERANCE, TO A DEGREE

As with most other things, there are degrees of fault tolerance. At one end of the scale is the conventional system—the everyday computer—that offers fault tolerance, self-checking, or hardware redundancy. At the opposite extreme is the continuous, nonstop processor that never crashes, offers total hardware redundancy, and checks itself constantly.

Moving toward this ideal is the Tandem NonStop configuration, whose phenomenal success now has spawned a whole new industry. With the Tandem setup, two central processors handle separate data processing loads and constantly check each other's operation. Either can take over both jobs if one should fail. The failed cpu must then be brought back through software and programmer intervention.

Digital Equipment Corp. is expected to continue this approach next year, when it's targeted to make a dual VAX 11/80 configuration available. (An earlier attempt with PDP-11/70s failed.) IBM is another company that is expected to offer a special purpose dual configuration using 4300s. Like Tandem, both these companies will rely on scarce and much needed programming resources in the event one processor fails, experts point out.

Like most new ventures, Synapse Computers, Milpitas, Calif., has the option of a more technologically current approach to nonstop than Tandem did when its systems debuted in 1976. The availability of step-function semiconductor technology, coupled with a powerful new operating system, offers Synapse the chance to bring a processor back using hardware alone, but before this can happen the system has to crash for a brief time.

In contrast, Natick, Mass.-based Stratus Computer Corp., currently Tandem's only major competitor, seems to have produced a crash-proof, totally redundant system. Both its design team and architecture have been highly praised. Stratus president Bill Foster and his team developed a Noah's Ark system wherein all main controller boards—cpu, memory, disk, communications, and tape controllers—"go in two by two" and constantly check each other.

Foster says that a failure in any one of the components does not affect the system in any way, and the broken component can be replaced while the system is running. The Stratus exec also claims that he can offer a self-checking system for just 3% more than the cost of his own conventional computer. "The additional cost for self-checking is only a very small part of the total system cost, since peripherals, software, and service—together making 80% of the total—remain unchanged," he says. This potent fact is the key to the tremendous success Stratus is currently enjoying.

"Everywhere you turn, people costs are rising, and with them the costs of down time, systems and applications software, and service," Foster explains. "In stark contrast, the primary elements in our approach—electronics and peripherals—are getting less expensive by the minute. This means that what is an advantage today will become an even bigger advantage in the future."

Currently Foster does have one nagging problem—when, and by how much, to increase his sales force. His current team of 15 should triple by year-end, and his installation count should double from 20 to 40. The company will become profitable next year and could touch sales of $200 million by 1986, Foster told a recent DATAMATION/Cowen & Co. conference.

Stratus will be joined next year by at least three other East Coast fault-tolerant contenders: Parallel Computers, Englewood Cliffs, N.J.; Sequoia Systems, Natick, Mass.; and Computer Consoles, Rochester, N.Y. Companies claiming fault tolerance in other market segments, such as data acquisition and process monitoring and control, shared disk word processing, and local area network-based micros sharing a word processor, include August Systems, Salem, Ore.; Syntrex, Eatontown, N.J.; and DOSC, Albertson, N.Y.

But for all these fault-tolerant suppliers, it will be a question of degree.

—R. E.

address up to 16MB. "The key issue between all the new competitors and Tandem is the use of microprocessors," says Serlin. He avers that what Tandem can't afford to do is provide the kind of redundancy that, for example, another new vendor, Stratus, provides. This Natick, Mass., startup has two processors working together, checking each other's work. If there is disagreement between them, they declare themselves bad and another duplicated unit, which has been working alongside the first pair, takes over. "You could not possibly do this economically with the minicomputer approach," he adds.

With Tandem, an application is loaded into processor A, which automatically stores a duplicate in processor B, which is running a different job. By passing messages, the status of the original processor and the program it is running is communicated to the other processor. When the original processor goes down, thereby failing to send a message, the work is picked up by the second processor. But in this setup, there is no idle processor that merely serves as a backup or standby, waiting for another processor to fail.

In such a setup, there is no central repository of data about what the system is doing. The processors are linked to a high-speed bus by which they keep up-to-date on

what is going on. Each processor has its own copy of the operating system.

By contrast, the Synapse system uses a shared memory with data about what's happening in the system. All processors, except the I/O processors, run off this main memory. It raises questions about the bandwidth of that memory and when it might run out of capacity. Additionally there's the concern about a single point of failure existing, especially in a fault-tolerant system. If one portion of main memory fails, one or more processors could also be forced to go down.

But all that may be academic. Processor failures have become so rare that the concern might be more with disk failures. Or, as Omri Serlin notes, "It's errors on the part of the users in creating those transactions that are causing most of the problems in the database." He thinks the issue of fault tolerance is difficult to prove, that customers just take the word of the manufacturer. Others, too, say that fault tolerance can be achieved by the hardware design, by the operating system design, and the way applications programs are written—using checkpointing, for example. And they observe that users tend to rely only on the first two factors, both provided by the system vendor, for their safety. Besides, there may be other reasons people have been buying the Tandem NonStops. And those other reasons are just as important as, if not more important than, fault tolerance.

—Edward K. Yasaki

REGULATIONS

BOTHERED BY EMI?

Electromagnetic interference from PCs is a problem for vendors, users, and the Federal Communications Commission.

Computer users will little note nor long remember Federal Communications Commission Docket 20780. The FCC is doing its utmost to ensure that manufacturers and vendors will never forget it.

The document is not that difficult to commit to memory. It sets forth FCC rules for computing devices. The rules are an attempt to limit radio emissions from computers and associated devices using digital circuitry in order to minimize the potential for interference to television and radio communications. You might not think your lovable personal computer is capable of snowing out your neighbor's television, but it is. As Casey Stengel so often said, you could look it up.

In the course of its investigations into products being offered for sale to the masses in retail stores, it has come to the FCC's attention that some manufacturers don't want to play by the rules. To try and ensure that everyone can join the game—let us not forget that this is a participatory democracy—the commission has begun hitting violators where it hurts. Three fines have been issued, with guarantees of more to come. The price is $2,000 per offense, with the total not to exceed $5,000.

"Of the products we found offered for sale in stores, 31.9% were not authorized by the rules," said Paul Harris of the FCC's Field Operations Bureau. "We looked at computers, FM radios, and cordless telephones. That's a significant noncompliance rate. It's three times what it should be. We hope for perfection, but we sure don't expect it. A 10% noncompliance rate would be acceptable.

"Of the products we found offered for sale in stores, 31.9% were not authorized by the rules."

"I don't know if they just don't want to comply or they're not following the rules out of ignorance. But we're going to fine people. We'll fine the manufacturers before the retailers. We'll give the retailers a citation, then fine them if we catch them again. We feel justified in doing it. This is a potentially serious problem that we'd like to end before it becomes unsolvable."

"This is a cause for great concern in the industry," admitted a source at a major computer manufacturer. "The rules have created a production and cost impact on the industry, although I don't think companies are as upset now as a few years ago. Over the long run the cost impact is not that great. Now most companies are aware of the rules and are struggling to comply. There is some basis for these rules. The FCC isn't being unreasonable."

Here's the way the whole thing started. Silly, but it's true.

As computers were fruitful and multiplied, so did complaints to the FCC of interference to tv and radio reception where the source of the bad vibes was identified as some form of computer. Exhibit A: purchasers of a popular computer marketed to the general public complained the machine totally destroyed tv reception in their own and neighbors' homes. Exhibit B: one of the leading personal computer manufacturers (reportedly IBM) has discovered that occasionally, while running the vendor's financial spreadsheet programs, the user finds simple arithmetic beyond the scope of the machine.

The FCC's first attempt to cope came in April 1976, when it instituted a rulemaking proceeding—the aforementioned Docket 20780—to clarify the rules governing restricted radiation devices (including computers) and to provide more realistic limits at VHF and UHF frequencies.

Enter the Computer and Business Equipment Manufacturers Association. It requested in January 1979 that the rules be adopted specifically for computing equipment. The petition requested more liberal limits than those established in the 1976 notice in Docket 20780. The commission heeded that plea in its order of October 1979, but established an equipment authorization procedure to become effective July 1, 1980.

Deciding that life is too short for that much of a hassle, the industry prevailed upon the FCC to relax the compliance schedule and make a number of minor modifications to the computer rules. The rules were further revised in 1981. Final measurement rules for computing equipment were released in March 1981. None of these permutations altered the thrust of the FCC's First Commandment: thou shalt comply.

The commandment binds both halves of the computer universe. Class A computing devices are those marketed for use in a business/commercial/industrial area. Class B devices are those marketed for use in a residential (home) environment. Using such a computer in a business does not change the classification. A personal computer is a subclass of the Class B solar system.

The FCC has also decreed two equipment authorization procedures that "are not optional for the manufacturer," as it notes in Bulletin OST (Office of Science and Technology) 54. Before either of the computer types can find its way to market, it must be either verified or certified. Class A devices need only be verified. Under that procedure a manufacturer tests the device to determine if it complies with the applicable FCC standard. As soon as he is satisfied that the answer is yes and labels the device as required, he may begin marketing it.

"This really is the first example of the government regulating computers."

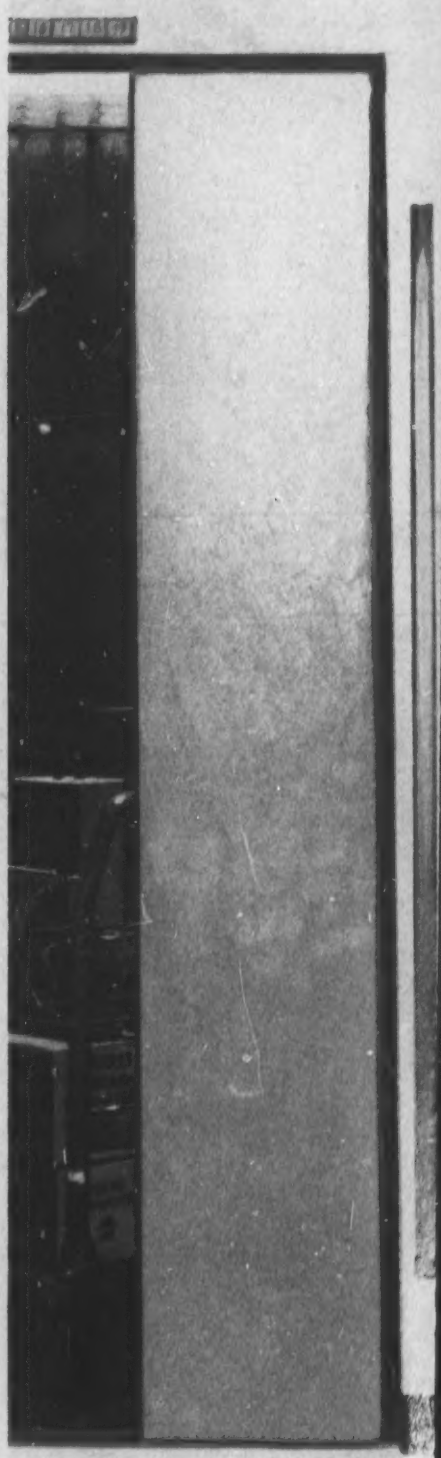
Life is much harsher in the Class B world. Not only must those devices submit to stricter emission standards, they cannot be legally sold without being certified. Under that system the applicant, normally the manufacturer, files an application with the FCC. The application must include: 1) a detailed report of measurements, 2) a block diagram of the computing device, 3) a narrative statement describing how the device operates, 4) the instruction manual furnished to the purchaser, 5) photographs showing the general appearance and component layout of the equipment, and 6) an engineering drawing or photo of the proposed equipment identification nameplate.

The FCC also reserves the right to request the equipment for a pregrant sam-

How are corporations responding to the onslaught of the personal computer? A survey.

WE'RE NOT REALLY SURE HOW MANY WE HAVE...

by Amy D. Wohl and Kathleen Carey



Most computer-related technology has been slow to make its mark on the average office. This has been due mainly to the cost and complexity of implementing the equipment—barriers that required a high degree of marketing expertise on the part of the manufacturers to cost-justify the products and then to train and support the office user. Word processors are an example of this slow process, taking over 15 years to arrive in significant numbers on the office scene.

Electronic calculators and now their more powerful cousins—personal computers—are exceptions to this rule. The calculator took just five years to clobber the old adding machine in the office. The personal computer is showing signs of gaining a strong foothold in the office in an even shorter period of time, both as a lower-cost alternative to dedicated word processors and as a computation or information processing tool for individual managers, professionals, or executives. Indeed, the personal computer may even affect the ways dp departments handle regular data processing within the corporation, and could provide the gateway for automating the office in the '80s.

Why the forecast for a quick success? First is cost: hardware and software are relatively cheap. Even today's simple, game-playing personal computers come with a bang-per-buck price tag that would have been impossible just a decade ago. Second is perceived complexity. Though just as hard (or easy) to use as, let's say, a word processor, the personal computer, coming from a home, game-playing environment, is perceived as simple to use or apply. Vendors don't have to go into gyrations to sell the product, and need not do much (if any) user handholding.

Finally, personal computers now come supported by a wide variety of software. Third-party packages compatible with the "universal" operating systems of CP/M, MS-DOS, Apple DOS, TRS-DOS, etc., allow personal computers to be applied to a great many office and business tasks. True, much of this software may come from basement or garage shops, but there are increasing numbers of good packages being marketed by reputable program houses.

So, with or without the blessing or knowledge of corporate management, personal business computers (PBCs) are now being squirreled away in the nooks and crannies of almost every office. Many managers are unable to say just how many are currently installed in their organizations, and opinions on how to govern their acquisition and application are many and varied.

To gauge the extent to which PBCs have penetrated the corporation, and to determine their users and uses, Advanced Office Concepts conducted a survey. The following discussion summarizes the results found in AOC's full report, *Policy for the Personal Business Computer*.

Of the almost 250 corporate users responding, fully 26% came from the ranks of the U.S.'s 1,000 largest companies, with 60% having 1,000 or more employees. Over 75% employ IBM mainframe computers and 50% use other mainframes. The main businesses of the respondents, when given, are shown in Table I.

Among the companies that could count their installed base of personal computers, almost 17% found more than 30 installed.

Note, however, the "could count" caveat. Most companies do not know with

More than 67% of the corporate users surveyed have no guidelines for personal computer use.

absolute certainty the actual number of PBCs they have paid for, let alone the users or uses to which they are applied. The numbers given (see Table II) may therefore be on the low side.

APPLE MOST POPULAR

Which are the preferred brands? At present, the Apple is by far the most popular; almost 70% of those responding to this question use at least one Apple, and most listed multiple installations. Predictably, Radio Shack came in second, with over 40% employing TRS-80 models. Third in popularity was the IBM Personal Computer; we feel that the 30% that listed IBM included a significant number of machines that are on order. All other brand names were mentioned in far less significant numbers (see Table III). By next year, however, this overall complexion of brand preference should change, with IBM gaining a higher market share and other vendors such as DEC and Wang joining the list.

Participants were asked to name the highest and lowest level of employee presently using a PBC. In the lowest-level category, the professional employees—managers, programmers, financial analysts, and technical and accounting staff—were mentioned almost 44% of the time (see Table IV). Nonprofessionals were cited by 27%.

In the highest-level category (Table V), middle management was mentioned most frequently with 39%, followed by upper management with almost 33% and professionals with 7.5%.

As for the uses to which these workers are applying their computers, almost 80% are found to be performing financial calculations (see Table VI). VisiCalc and its "Visiclones" are also probably represented in the 21% used for marketing applications.

Nearly 40% of the respondents said that PBCs are supported as terminals on a mainframe. This information is displayed in Table VII, along with the answers to two related questions:

- Are file transfers permitted from the mainframe to personal computers?
- Is database updating permitted from the personal computer?

Mainframe/PBC file transfers occur in nearly a third of the companies, with an additional 14.7% planning to permit them in the future. On the question of database updating, the nays were more resounding. Over three quarters of the companies do not allow database updating from PBCs, and only 5% plan to permit it in the future. The negatives may represent the large amount of off-line, departmental work currently done on PBCs, rather than a firm bias against the practice.

A mere 8% of the corporate respondents indicated that firm guidelines governing the acquisition of PBCs were in place (see Table VIII). Only 24% reported that informal rules were being applied toward the purchase of PBCs on an experimental basis. That leaves about 67% of the present PBC corporate users surveyed with no guidelines or procedures in place. And, of this number, only 36% stated intentions to implement guidelines. Thus, it looks like the free-for-all market for personal computers in the office environment will exist for some time to come.

THE APPROVAL CYCLE

Although corporate-wide policy towards PBCs is still unclear, the respondents did indicate that some department was involved in the approval cycle. Not surprisingly, the dp department leads in this area, with nearly 55% of the responses stating that dp was involved in final approval (see Table IX). The individual user department, however, still has a good deal of autonomy, with 43% stating that approval rested there. The purchasing department came in a distant third with only 14% of the responses.

Multidepartment approval was involved in about 12% of the cases surveyed. In some companies, more than one approval is required or the end user has a choice in the purchasing source.

Rephrasing the question, participants were asked if the dp department had absolute approval or veto power over the acquisition of a personal computer. In at least one third of the companies surveyed the dp group does have such authority (see Table X).

The survey indicated a degree of confusion about setting policies, as well as a lack of planning, strategic or otherwise, in the implementation of PBCs as part of an overall information system. To complicate matters further, PBCs may function independent of any centralized dp facility as an executive work tool or gadget or, in the same environment, as nodes in a distributed network. Left unresolved at present are issues involving the overhead PBCs might place on such networks in their communicating modes; the compatibility of personal versus mainframe data or test files; the interfacing of personal computers in their own independent local networks; and the use of PBCs in local nets as office automation systems. With at least 1 million units expected to join the present PBC installed base over the next 12 months, now is the time to consider these issues and define some guidelines.

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TABLE I

RESPONDENTS BY INDUSTRY TYPE

INDUSTRY	RESPONSES NO.	%
Manufacturing	48	38.4
Government	17	13.6
Insurance	17	13.6
Education	16	12.8
Utility	14	11.2
Banking fiance	13	10.4
Total	125	100.00

TABLE II

INSTALLED PBCS

RANGES	RESPONDENTS NO.	%
1-5	64	45.1
6-10	26	18.3
11-20	20	14.1
21-30	8	5.6
31+	24	16.9
Total	142	100.00

TABLE III

PERSONAL COMPUTER BRANDS

VENDOR	RESPONSES NO.	%
1. Apple	126	69.6
2. Radio Shack	72	41.4
3. IBM	57	31.4
4. Hewlett-Packard	15	8.3
5. Commodore	12	6.6
6. Health Zenith	9	5.0
7. Xerox	7	3.8
8. Atari	6	3.3
9. Osborne	5	2.7
10. Texas Instruments	5	2.7

*Based on 181 total responses, several respondents listed multiple vendors.

TABLE IV

LOWEST LEVEL OF PBC USERS

PROFESSIONAL

POSITION	TOTAL
Manager	15
Programmer	14
Financial analyst	9
Technical	7
Accounting	6
Total	**51**
Percent*	43.6

NONPROFESSIONAL

POSITION	TOTAL
Secretarial	14
Clerical	13
Sales	5
Total	**32**
Percent*	27.3

*Based on 117 total responses

TABLE V

HIGHEST LEVEL OF PBC USERS

UPPER MANAGEMENT

Vice president	31
President	14
Ceo	5
Executive	2
Total	**52**
Percent*	32.7

MIDDLE MANAGEMENT

Manager	36
Director	13
Financial advisor	9
Supervisor	4
Total	**62**
Percent*	39.0

PROFESSIONALS

Consultant	3
Engineer	2
Programmer	7
Total	**12**
Percent*	7.5

*Based on 159 total respones

TABLE VI

APPLICATIONS

	RESPONSES	
	NO.	%
Financial	135	78.9
Word processing	63	36.8
Scientific	55	32.2
Marketing	35	20.5

*Based on 171 total responses: several respondents listed multiple applications.

TABLE VII

PBCS AS TERMINALS

	TOTAL RESPONSES	YES		NO		PLAN TO	
		NO.	%	NO.	%	NO.	%
Supported now	199	76	38.2	123	61.8	0	0
File transfers allowed	156	49	31.4	84	54.0	23	14.7
Databased updating allowed	150	25	16.7	117	78.0	8	5.3

*Percentage of total responses for this function.

TABLE VIII

DO YOU HAVE A POLICY IN EFFECT NOW?

TOTAL RESPONSES	NO		YES		OTHER	
	No.	%	No.	%	No.	%
240	162	87.5	20	8.3	58	24.2

TABLE IX

WHO APPROVES PBC PURCHASE?

	RESPONSES	
	NO.	%
Data processing	113	54.6*
Individual departments	89	42.9
Purchasing	30	14.4

*Based on 207 total responses. Several respondents listed multiple answers.

TABLE X

DP—ABSOLUTE APPROVAL OR VETO?

TOTAL RESPONSES	YES		NO	
	NO.	%	NO.	%
200	67	33.5	133	66.5

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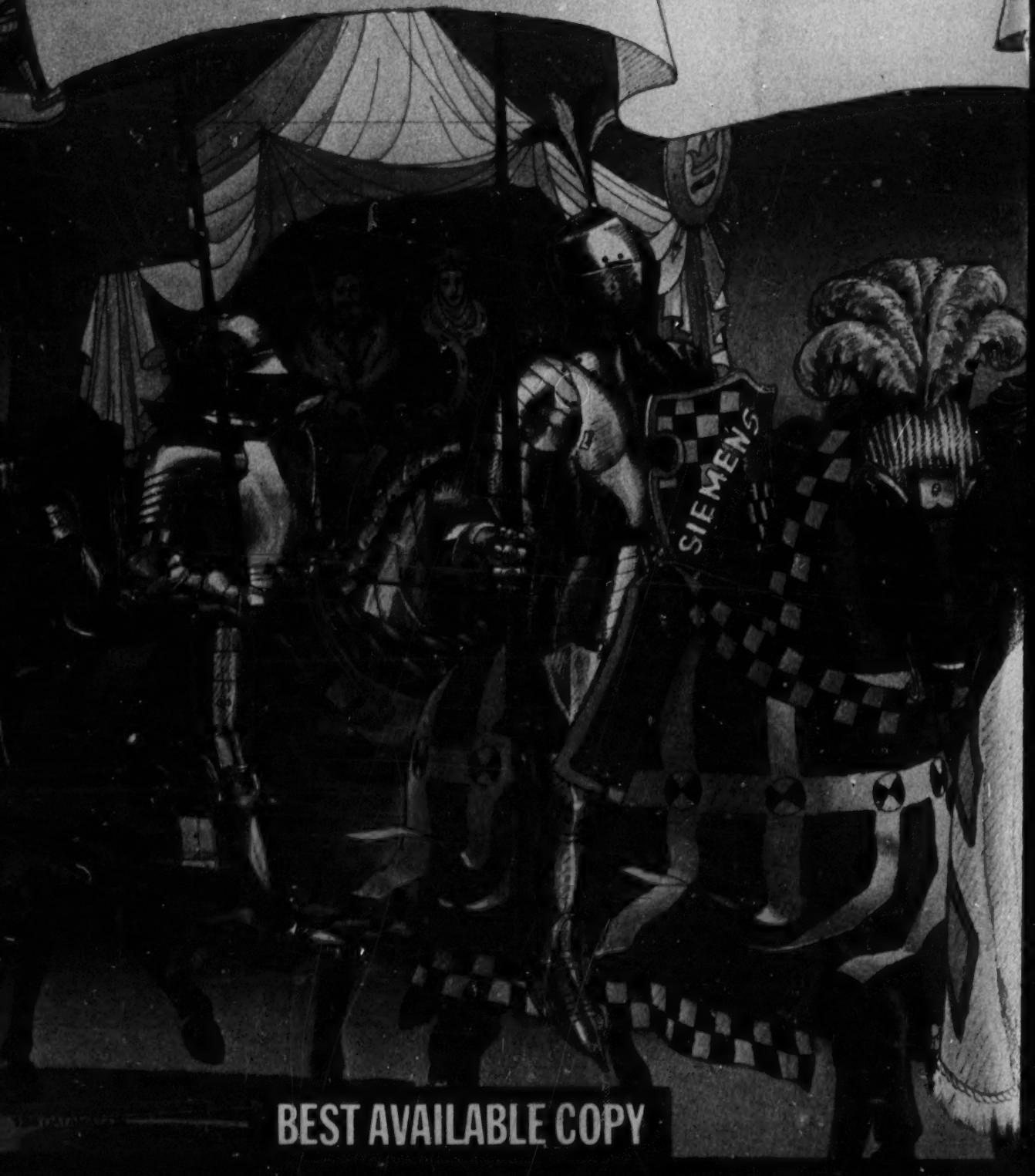
DATAMATION knights the mightiest dp companies

REVIEWING EUROPE'S TOP 25

Throughout 1981 the worldwide recession continued to hold Europe in its grip—a situation that left the computer industry in a state of stagnation. Most companies struggled to maintain their 1980 revenue levels, and there were few success stories.

Unemployment continued to rise in Europe and in most countries the inflation rate was between 10% and 15%. Europe looks anxiously to America to lead it out of the recession, but very little growth in the U.S. economy is expected this year.



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"Reaganomics," which is restricting the money supply and keeping interest rates high, will offer no relief, it is predicted, until 1983.

Companies on both sides of the Atlantic have been hit extremely hard by exchange rate fluctuations. European currency values fell very sharply against the dollar during 1981, some by as much as 30%. This means that while European revenues may have shown good growth in terms of local currency, these same revenues were dismally lower when calculated in U.S. dollars.

IBM remains in an unassailable position at the top of the chart despite its poor performance in Europe. The company's proportion of the total revenues for the Top 25 in Europe dropped from 41% in 1980 to 37% in 1981. IBM's European revenues fell 6% despite a worldwide increase of 10%. It is obvious that IBM's growth is slowing down considerably, which is inevitable for a corporation of such size. IBM's net earnings also slumped between 1980 and 1981.

Although IBM still has a very strong hold on the top end of the market, large mainframe sales have become very sluggish. IBM made moves last year to improve its weak position at the lower end of the market, where industry growth is still impressive. IBM products are beginning to appear in retail stores, and the company has also enhanced its range of office products, personal computers, and small business systems.

IBM is currently facing up to the potential threat posed by AT&T's entry into the

ILLUSTRATION BY ROGER BRADE

The leading European company in 1981 was Cii-HB.

information technology market. Ma Bell comes even higher than antitrust suits on IBM's list of priorities. Finally, after 13 years, the U.S. government's antitrust case against IBM has been resolved in the firm's favor. Now the giant company must turn its attention to the litigation brought against it by the EEC—litigation that seeks relief for the same practices that have been given a clean bill of health in the U.S.

GROWING GRAPHICS MARKET

The fastest growing market in the dp industry at the moment is graphics, with some companies achieving revenue increases of 100% or more. The office automation arena is also showing very good growth at a current average of about 50% per annum. Although no microcomputer manufacturers have broken into Europe's Top 25, their entry should be imminent since growth in this sector continues at 50%. The previous spectacular growth of minicomputer makers has slowed to a steady 30%, but that is a good showing compared to most other large industry companies that have chalked up gains of only 10%.

The fastest growing companies in the European dp market are shown in Table I. As it was in 1980, this table is dominated by American companies. Comparing this table with last year's, it is especially noticeable that the overall market growth rate has slowed to virtually nothing. In 1980 ITT ranked last in our table with a growth rate of 24%. In this year's table the last place is jointly held by Honeywell Information Systems and Burroughs, both of which recorded a paltry 1% increase in revenues. The remaining companies maintained static or below par sales revenues. Against this generally gloomy picture, the growth of ITT, Digital Equipment, and Wang is quite spectacular, reflecting new trends in the market as well as new marketing strategies, particularly on the part of ITT.

Of course, when these companies' growth rates are calculated in terms of their own accounting currencies, Table I is transformed into Table II. Olivetti then shoots up to first place with a growth of 52%, due in part to its takeover of Logabax. Ferranti, Datasaab, Nixdorf, Thomson-CSF, and Cii-Honeywell Bull outdistanced most of their American rivals in terms of 1981 growth. To the extent that a company's overall health is measured in its accounting currency, this difference is very significant. For example, the 25% increase in Datasaab's revenue in Swedish kroner is the important indicator of its future, rather than the somewhat artificial 5% gain that results when its revenue is converted into U.S. dollars.

Nevertheless, 13 out of the Top 25 companies in Europe are American—the same proportion as last year. Together they account for 67% of the total revenues of all the Top 25 companies. If IBM is excluded, however, that percentage drops to 27%, showing that European companies have a strong, expanding Continental base.

TABLE I

TOP REVENUE GROWTH RATES IN U.S. $

		DP% GROWTH RATE*
1.	ITT	47
2.	DEC	38
3.	Wang	34
4.	Olivetti	15
5.	CIT Alcatel	13
	Univac	13
6.	Hewlett-Packard	8
7.	Datasaab	5
	Plessey	5
8.	Burroughs	1
	HIS	1

*European revenue, FY 1981

TABLE II

TOP REVENUE GROWTH RATES IN ACTUAL ACCOUNTING CURRENCIES

		DP% GROWTH RATE*
1.	Olivetti	52
2.	ITT	47
3.	DEC	38
4.	Wang	34
5.	CIT Alcatel	30
6.	Ferranti	29
7.	Datasaab	25
8.	Nixdorf	21
9.	Thomson-CSF	19
10.	Cii-HB	17

*European revenue, FY 1981

Britain, France, and Germany each have three companies in the Top 25, while Italy, the Netherlands, and Sweden each have one. This accurately reflects the relative strengths of the dp industry in each of these European countries. It is unlikely that any other European nation will develop its computer industry sufficiently to produce a firm large enough to enter the Datamation Top 25 for some years to come.

IMPORTANT RANKING CHANGES

Several significant ranking changes have taken place since 1980. At the upper end of the table, DEC has moved up four notches from number eight to number four in Europe, knocking ICL into the fifth position. (ICL nevertheless achieved highest worldwide dp revenues of all the European companies.) Cii-HB and Siemens exchanged places, mainly due to a very poor year for Siemens. This means that in 1981 Cii-HB was the leading European company.

Philips, which had no official ranking last year because of the difficulty in obtaining exact dp revenue figures, has revealed itself this year to be a much more powerful force in the European dp world than a lot of people expected. Pegged in the ninth niche in 1981, Philips shows great promise of moving still higher in the future.

Meanwhile, ITT, with its 47% growth rate, has also made significant strides, jumping from 24th in 1980 to 17th last year.

The only true newcomer to the Top 25 list is Wang, which shows up in the 23rd slot now that word processing revenues are included in our definition for the DATAMATION Top 25. The entry of Philips and Wang means that two companies have been pushed off the bottom of the table—the French software house CISI and the American plug-compatible manufacturer Amdahl. Burroughs' complete takeover of Memorex and Datasaab's amalgamation with parts of its parent LM Ericsson portend some more dramatic changes in position for 1982.

Over the past year enormous changes have been wrought in the French dp industry as a result of the Socialist government's nationalization program. In the works since July 1981, the nationalization plans were finally approved last February. Negotiations on the details are likely to continue for a long time, and the reverberations from the nationalization effort on the European market as a whole are bound to affect the industry for some time to come.

The French government now has overall control of the three largest corporations that have electronics interests: Thomson-Brandt, with its subsidiary Thomson-CSF; Compagnie Générale d' Electricité (CGE), parent of CIT Alcatel; and Saint Gobain, with its affiliate Cii-Honeywell Bull. Honeywell's stake in Cii-HB has been reduced from 47% to 19%, and the government wants to take a 51% controlling interest from ITT in Compagnie Générale de Constructions Téléphoniques.

The past 12 months have been far from easy for those French companies caught up in the turmoil and uncertainties of nationalization. Even after the final nationalization

Around the world, 1981 was office automation year.

DATAMATION'S EUROPEAN TOP 25

1981 RANK	COMPANY	1980 RANK	PARENT COMPANY HQ	EUROPEAN DP REV. CAL. YR. 1981 (IN $ MIL.)	% CHANGE EUROPEAN DP REV. FY 1980/81 (IN $)	%CHANGE EUROPEAN DP REV. FY 1980/81 (IN ACCOUNTING CURRENCIES)	DP REV. DOMESTIC (PARENT CO.) FY 1981 (IN $ MIL.)
1.	IBM	1	U.S.	8,846	− 6	− 6	16,945
2.	Cii-Honeywell Bull	3	France	1,311	− 9	+17	754
3.	Siemens	2	W. Germany	1,296	−15	+ 4	*
4.	Digital Equipment	8	U.S.	1,162	+38	+38	2,631
5.	ICL	4	U.K.	1,067	−11	− 5	826
6.	Olivetti	5	Italy	1,006	+15	+52	*
7.	Sperry Univac[1]	6	U.S.	850	+13	+13	1,737
8.	Control Data	9	U.S.	765	+0.1	+0.1	*
9.	Philips[1]	n/a	Netherlands	750	*	*	*
10.	Burroughs	10	U.S.	742	+ 1	+ 1	2,037
11.	NCR	7	U.S.	728	−10	−10	*
12.	Nixdorf	11	W. Germany	678	− 4	+21	292
13.	Hewlett-Packard	12	U.S.	604	+ 8	+ 8	*
14.	CIT Alcatel	14	France	556	+13	+30	*
15.	Honeywell Infor. Systems	15	U.S.	497	+ 1	+ 1	*
16.	Thomson-CSF	13	France	460	− 7	+19	*
17.	ITT	24	U.S.	233	+47	+47	*
18.	Rank Xerox[1]	18	U.S.	219	−14	−14	467
19.	Ferranti	20	U.K.	213	+39	+29	*
20.	Kienzle	19	W. Germany	207	−0.5	+ 5	139
21.	Datasaab	17	Sweden	203	+ 5	+25	136
22.	Plessey[1]	16	U.K.	203	+ 5	+ 8	189
23.	Wang	n/a	U.S.	201	+34	+34	701
24.	Data General	22	U.S.	171	+0.6	+0.6	478
25.	Memorex[1]	21	U.S.	158	−10	−10	*

n/a Not applicable *Not available [1]Estimates

legislation was announced, it was still unclear what the government's industry plans would be. Under these circumstances, management has had little incentive to draw up strategy plans, and foreign customers have hesitated before buying their goods. U.S. and Japanese competitors did not miss this chance to make marketing inroads. The French firms, as a result, will have considerable ground to make up.

Back in the U.K. things were looking better for ICL at the end of 1981. In 1982 ICL is believed to be trading profitably and by 1983 it is expected to show an overall profit. The new management team of Rob Wilmott (managing director) and Chris Laidlaw (chairman) has breathed new life and dynamism into the old ICL, which seemed to have lost all motivation and sense of direction.

Significant changes have been made, including mass layoffs and plant closures, rationalization of product ranges, and deals with a number of manufacturers, notably Fujitsu, Three Rivers, Mitel, Sinclair, Rair, and Logica. These agreements are expected to fill in gaps in ICL's product line. Although ICL slipped into fifth position in the 1981 DATAMATION Top 25, it may well move back up the chart to join the leaders by 1983.

The merging of Datasaab with two divisions of its parent LM Ericsson to form Ericsson Information Systems (EIS) may signal the emergence of Sweden as a major power in the European dp industry. Revenues, coming mainly from office automation equipment and telecommunications expertise, could reach $550 million in 1982. This almost doubles Datasaab's previous sales figures and could mean a jump of several places in next year's DATAMATION Top 25 table.

As was true in 1980, no Japanese company has broken into the ranks of the European Top 25. Several European companies, such as ICL and Siemens, however, are selling Japanese mainframes under their own labels. Most of the Japanese manufacturers have set high export targets for the latter part of the 1980s. Nippon Electric (NEC) plans to be exporting 40% of its production—roughly $455 million worth—by 1985. Hitachi and Mitsubishi both hope for 10% in 1983. Fujitsu, the largest Japanese exporter, sells mainframes directly to Australia, Spain, and the Far East and indirectly in Europe through Siemens and ICL. It already sells subassemblies to Amdahl and will do the same for ICL for its Estriel machine. Fujitsu's 1981 exports totaled $264 million—13% of its output. Exports are expected to grow 30% to around $900 million in 1985. It is easy to predict that Japan Inc. will soon make an appearance in the DATAMATION Top 25—and apparently with an open invitation from most European manufacturers.

If 1982 is information technology year in the U.K., 1981 must have been office automation year around the world. The press was swamped with announcements from almost every major and minor manufacturer, detailing their electronic office strategies and plans. Despite the fact that very few of these announced products are likely to be automating anyone's office any time soon, enthusiasm was boundless and anyone without a publicized electronic office game plan was considered to be out of the race. The DATAMATION Top 25 celebrated this phenomenon with the entry of Wang into its ranking. Some

DP REV. WORLDWIDE FY 1981 (IN $ MIL.)	TOTAL REV. EUROPE FY 1981 (IN $ MIL.)	TOTAL REV. WORLDWIDE FY 1981 (IN $ MIL.)	% CHANGE IN TOTAL WORLDWIDE REV. 1980/81	TOTAL NET INCOME WORLDWIDE FY 1981 (IN $ MIL.)	% CHANGE TOTAL NET INCOME WORLDWIDE FY 1980/81	TOTAL WORLDWIDE EMPLOYEES	YEAR ENDING
29,070	8,846	29,070	+ 11	3,308	- 7	354,936	Dec.
1,352	1,311	1,352	- 9	- 79	- 284	21,198	Dec.
1,330	10,917	15,854	- 12	234	- 34	338,000	Sept.
3,198	935	3,198	+ 35	343	+ 37	66,000	June
1,513	1,134	1,513	- 6	- 117	- 392	24,625	Sept.
1,436	1,748	2,540	- 0.2	*	*	50,471	Dec.
3,039	1,737	5,427	+ 8	*	*	*	Mar.
3,101	765	4,163	+ 9	171	+ 13	60,627	Dec.
*	9,500	16,964	- 8	143	- 17	348,100	Dec.
3,405	742	3,405	+ 17	149	+ 82	66,900	Dec.
2,838	904	3,433	+ 3	208	- 19	65,000	Dec.
856	678	856	+ 0.1	18	- 57	14,760	Dec.
1,771	1,205	3,578	+ 15	312	+ 16	64,000	Oct.
*	1,711	1,976	+ 10	*	*	40,000	Dec.
1,634	985	4,925	+ 9	259	- 10	29,000	Dec.
*	2,521	*	*	*	*	8,350	Dec.
528	9,700	23,200	- 3	677	- 10	324,000	Dec.
817	2,332	8,691	+ 6	598	+ 6	120,981	Dec.
249	555	634	+ 35	38	+ 78	6,153	Mar.
217	402	402	+ 0.5	*	*	8,700	Mar.
231	203	257	- 7	*	*	3,550	Dec.
301	1,413	1,973	+ 21	130	+ 45	47,339	Mar.
856	172	856	+ 58	78	+ 50	15,700	June
737	167	737	+ 13	51	- 7	14,920	Sept.
452	243	695	- 10	*	*	*	Dec.

estimates pinpoint word processor sales growth as high as 50%, and major companies such as IBM, Wang, Xerox, and Philips are likely to be the main beneficiaries.

METHODOLOGY

Information for the European Top 25 survey was solicited through a questionnaire. For the purposes of the survey, Europe was taken to include Austria, Belgium, Denmark, Finland, France, West Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the U.K. Dp and related activities were defined as covering the following product areas:

- *Mainframes*
- *Minicomputers and microcomputers—computers with a minimum of system software—and small business systems and personal computers*
- *Terminals and peripherals—all those connected, either directly or via data communications links, to a dp system*
- *Software and services: bureau services, database services, software packages, etc.*
- *Word processing equipment*
- *Data communications equipment, including data connections (modems and equivalent) and communications processors (multiplexors, concentrators)*

The following products were specifically excluded: general office equipment, electronic cash registers, electronic and magnetic card typewriters, instrumentation, dp supplies, and switching equipment supplied to PTTs for their data services.

The main ranking was based on 1981 calendar year revenues (in U.S. dollars) from dp operations in Europe for each company. Figures for companies whose fiscal year did not end December 1981 were adjusted, using published quarterly figures or estimates. All other figures appearing in this survey relate to the companies' reported results of their fiscal year ending 1981. In the main table, all results have been converted to U.S. dollars, using OECD exchange rate statistics for the appropriate time period. An additional column showing growth rates in actual accounting currencies has been included this year, due to the anomalies produced by fluctuating exchange rates.

While the 1980 ranking was correct, any inaccuracies uncovered in last year's table have been corrected and used for calculating the 1981 growth rates. Total revenue figures for Europe and worldwide refer to the parent company, where appropriate. When the parent company itself is not strongly involved in dp, the principal company has been considered as independent. Anomalies in the figures are inevitable since some companies do not give a revenue breakdown for the appropriate categories. Estimates were used for Sperry Univac, Plessey, and Rank Xerox because these firms did not provide answers to the survey questionnaire. ●

DATAMATION's Top 25 survey was prepared by Logica, a London-based computer system and software house. Logica provides marketing consultancy services for the computer and communications industries such as the Eurodata Reports on data communications and Tarifica on communications facilities.